KUSAM-MECO®

An ISO 9001:2008 Company

4½ Digit TRMS Bench-Type DMM
Model - KM 8045

SPECIAL FEATURES :

- 4½ Digit high performance Bench-type DMM, with backlight LCD display.
- It can be used to measure DC and AC Voltage, DC and AC Current, Resistance, Capacitance, Hz, hFE, Diodes and Continuity.
- The max. Voltage measurement is up to 1000V DC or AC peak value, resolution is 10 V, and current measurement is up to 20A, it also has the function of polarity auto-change, back light display.
- For AC measuring, it is performed by high accuracy true RMS, has the feature of wide bandwidth measuring & to get accurate RMS for AC flow of any waveform or AC+DC.

GENERAL SPECIFICATIONS :

- **Sensing :** True RMS Sensing.
- **Basic Accuracy :** ±(0.05%rdg + 3dgt)
- **Display :** 4½ digit large LCD display 19999 counts.
- **Display Size :** 30 x 23 mm
- **Sampling rate :** approx.3 times / sec.
- **Overrange display :** "1".
- **Operating Temperature :** 0°C to 40°C R.H. <80% R.H.
- **AC Voltage Frequency response :** 40Hz ~ 50kHz
- **Power :** DC 220V / 110V, 50/60Hz.
- **Dimension :** 260(L) x 220(W) x 82(H)mm
- **Weight :** Approx. 2 kg.

ACCESSORIES :

Test Leads, Operating Manual, Power cord.

OPTIONAL ACCESSORIES:

Current Clamp CA 300, Current Clamp Adaptor CA500, CA1000, CA2000, High Voltage Probe PD-28.

10 FUNCTIONS 29 RANGES

SAFETY :

KM 8045 adopts double integral A/D converter as its core. KM 8045 designed according to IEC1010 standard.

ELECTRICAL SPECIFICATIONS : KM 8045

Accuracy : ± (% reading + the lowest effective digit) Temperature for accuracy guarantee : (23±5)°C, <80% R.H.

DC VOLTAGE

Range	Resolution	Accuracy
200 mV	10 V	±(0.05%rdg + 3dgt)
2 V	100 V	
20 V	1 mV	
200 V	10 mV	
1000 V	100 mV	±(0.1%rdg + 5dgt)

Input Impedance : 10M for all ranges
Overload Protection : 200mV range : 250V DC or AC peak value. Other range : 1000V DC or AC peak value

DC CURRENT

Range	Resolution	Accuracy
20 mA	1 A	±(0.35%rdg + 10dgts)
200 mA	10 A	
2 A	100 A	±(0.8%rdg + 10dgts)
20 A	1 mA	

Max. Input voltage drop : 200mV
Max. Input current : 20A (within 10s)
Overload Protection : 2A / 250V fuse, 13A / 250V fuse

RESISTANCE

Range	Resolution	Accuracy
200	0.01	±(0.1%rdg + 20dgts)
2 k	0.1	±(0.1%rdg + 5dgts)
20 k	1	
200 k	10	
2 M	100	
20 M	1 k	±(0.5%rdg + 5dgts)

Open Voltage : less than 3V
Overload Protection : 250V DC or AC peak value
Note : At range 200 , short-circuit the test leads to measure the wire resistance & the subtracts it from the real measurement.

AC VOLTAGE

Range	Resolution	Accuracy
200 mV	10 V	±(0.8%rdg + 80dgts)
2 V	100 V	
20 V	1 mV	
200 V	10 mV	
750 V	100 mV	±(1.0%rdg + 50dgts)

The input value for accuracy guarantee should be larger than 10% of range.
Input resistance : 2M for all ranges
Overload Protection :
200mV range : 250V DC or AC peak value.
Other range : 1000V DC or AC peak value
Input Frequency :
200mV range : 50Hz ~ 50kHz
2V & 20V range : 50Hz ~ 20kHz
200V range : 50Hz ~ 5kHz
750V range : 50Hz ~ 400Hz

DIODE & CONTINUITY TEST

Range	Description
→||◦)))	The measuring value is the approx. Value for forward voltage drop. When the resistance under tested is less than 30 ± 10 , buzzer sounds and display the approx. Value. The open voltage is approx. 3V.

Test Condition : Forward DCA is approx. 1mA, backward DCV is less than 3V
Overload Protection : 250V DC and AC peak value.

AC CURRENT

Range	Resolution	Accuracy
200 mA	10 A	±(0.8%rdg + 80dgts)
2 A	100 A	±(1.0%rdg + 50dgts)
20 A	1 mA	

Max. Input voltage drop : 200mV
Max. Input current : 20A (within 10s)
Overload Protection : 2A / 250V fuse, 13A / 250V fuse
Input Frequency : 200mA range : 50Hz ~ 5kHz
2A & 20A range : 50Hz ~ 400Hz

CAPACITANCE

Range	Resolution	Accuracy
20 nF	1 pF	±(3.5%rdg + 20dgts)
2 F	100 pF	
200 F	10 nF	±(5%rdg + 30dgts)

Measuring Frequency : Approx. 400Hz,
Measuring Voltage : approx. 40mV.
Overload Protection : 36V DC or AC peak value

hFE MEASURING

Range	Displaying	Test Condition
hFE NPN or PNP	0~1000.0	Basic current is approx. 10 A, Vce is approx. 3V

FREQUENCY

Range	Resolution	Accuracy
20 kHz	1 Hz	±(1.0%rdg + 20dgts)
200 kHz	10 Hz	

Input Sensitivity : 500 mV rms
Overload Protection : 250V DC or AC peak value (within 15s)

All Specifications are subject to change without prior notice

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USE TRUE RMS WHEN MEASURING AC WAVEFORMS

The waveforms on today's AC power lines are anything but clean. Electronic equipment such as office computers, with their switching power supplies, produce harmonics that distort power-line waveforms. These distortions make measuring AC voltage inaccurate when you use an averaging DMM.

Average voltage measurements work fine when the signal you're measuring is a pure sine wave, but errors mount as the waveform distorts. By using true RMS measurements, however, you can measure the equivalent heating effect that a voltage produces, including the heating effects of harmonics. Table 1 shows the difference between measurements taken on averaging DMMs & those taken on true RMS DMMs. In each case, the measured signal's peak-to-peak value is 2V. Therefore, the peak value is 1V.

For a 1-V peak sine wave, the average & RMS values are both 0.707V. But when the input signal is no longer a sine wave, differences between the RMS values & the average readig values occur. Those errors are most prominent when you are measuring square waves & pulse waveforms, which are rich in harmonics.

Table 1. Average versus true RMS comparison of typical waveforms.

Waveform	Actual Pk-Pk	True RMS Reading	Average Reading	Reading Error
Sine Wave	2.000	0.707	0.707	0%
Triangle Wave	2.000	0.577	0.555	-3.8%
Square Wave	2.000	1.000	1.111	+11.1%
Pulse (25% duty Cycle)	2.000	0.433	0.416	-3.8%
Pulse (12.5% duty Cycle)	2.000	0.331	0.243	-26.5%
Pulse (6.25% duty Cycle)	2.000	0.242	0.130	-46.2%

One limitation to making true RMS measurements is crest factor, and you should consider crest factor when making AC measurements. Crest factor is the ratio of a waveform's peak ("crest") voltage to its RMS voltage. Table 2 shows the crest factors for ideal waveforms.

Table 2. Crest factors of typical waveforms.

Waveform	Crest Factor
DC	1.000
Square Wave	1.000
Sine Wave	1.414
Triangle Wave	1.732
Pulse (25% duty Cycle)	1.732
Pulse (12.5% duty Cycle)	2.646
Pulse (6.25% duty Cycle)	3.873

A DMM's specifications should tell you the maximum crest factor that the meter can handle while maintaining its measurement accuracy. True RMS meters can handle higher crest factors when a waveform's RMS voltage is in the middle of the meter's range setting. Typically, a DMM may tolerate a crest factor of 3 near the top of its scale but it might handle a crest factor of 5 that's in the middle of the range. Therefore, if you're measuring waveforms with high crest factors (greater than 3), you should adjust the DMM so the measured voltage is closest to the center of the measurement range.

Another limitation of true RMS is speed. If you're measuring relatively clean sine waves, then you can save time & money by using as averaging DMM. True RMS meters cost more than averaging meters and can take longer to produce measurements, especially when measuring millivolt-level AC signals. At those low levels, true RMS meters can take several seconds to stabilize a reading. Averaging meters won't leave you waiting.